



Bighead and Silver Carp in the Mississippi and Missouri Rivers

Columbia Environmental Research Center

Bighead and silver carp are large Asian species that escaped in the early nineties from fish culture operations and are expanding in range and in numbers within the Mississippi and Missouri River drainages. Both species can reach weights that exceed fifty pounds. Despite their recent arrival, Asian carps are already probably the most abundant large (> 5 pounds) fish in the lower Missouri River. Thousands of pounds of the fish can sometimes be caught from an area of less than half an acre. Like the zebra mussel, these highly invasive carps feed by filtering zooplankton and phytoplankton from the water. As the zebra mussel has shown, invasion of a huge biomass of filter-feeding organisms can totally change the ecology of an aquatic system. The Asian carps compete for food directly with the paddlefish, a native filter-feeding fish, and with most species of fish during the early life stages that feed on zooplankton.

Silver carp have recently received attention because of their (literal) impact on boaters. Silver carp react to the sound of outboard motors by jumping many feet into the air, often landing in boats and sometimes striking the passengers. With a boat speed of over 20 mph and fish exceeding 20 pounds, this can be disastrous. Jumping fish have seriously injured many boaters, and in addition damaged boats and their

non-human contents. Water skiing on the Missouri River is now exceedingly dangerous, because most of the fish jump behind the boat.

Bighead and silver carp are incapable of traveling upstream over large dams, and thus they have not yet been found in the large reservoirs on the Missouri River or its tributaries. Fishermen who use live fish for bait are urged to buy their bait from licensed suppliers and collect their own live bait only from the water being fished, to avoid transfer of these and other invasive fishes to new water bodies. Asian carp are expected to live very well in North American reservoirs, with potentially disastrous consequences to native fish populations.

Since October 2002, CERC scientists have been using telemetry and fishing with nets to determine habitat selection and behavior of bighead and silver carp in the Missouri River. A variety of habitat characterization techniques are being used to characterize the habitats selected by the fish, including water quality measurements, bathymetry, substrate classification, and acoustic doppler current mapping. Preliminary results have identified that both of these fishes, but especially silver carp, are highly active during cold water periods, and have continued to feed strongly at water temperatures at least as low as 2.5°C. Some silver carp moved more than a fifty miles downstream during the months of

December and January. Preliminary results have indicated distinct types of wing dike formations that these fishes prefer to occupy during cold weather periods. Although the preferred habitats are low velocity and somewhat removed from the main channel, during all but the coldest periods they often chose water with some current and often occupied eddies. Bighead and silver carp did not choose the deepest water available during the cold weather period. In spring of 2003, both species have been observed to make upstream migrations during high water periods, presumably for spawning. This information on the behavior and habitat selection of these fish is needed to predict impacts on native fishes and to formulate control methodologies.

Future directions of USGS research may include 1) identification of sex-hormone attractants that can serve as bait to trap fish on spawning migrations. 2) Diet studies to determine if Asian carps are feeding on the eggs and young of native fishes, and 3) development of models to determine the effect of Asian carps on the native food chain.

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Description and History

- Both silver and bighead carp escaped from private aquaculture facilities in the early 90's
- Both fish have spread to most of the Mississippi drainage
- High-head dams have so far prevented upstream movement to reservoirs
- First silver carp caught in South Dakota in May 2003 (James River)
- Grow quickly to very large size (>50 pounds)
- Bighead and silver carp are filter-feeders, consuming mostly zooplankton and phytoplankton
- Despite their recent introduction, they may now be the most abundant large (>5 pounds) fish in the lower Missouri River.
- Thousands of pounds can sometimes be caught from an area less than a half acre



USGS fisheries biologist, Duane Chapman holds bighead carp caught in the Missouri River.

Problems

- Competition with native fishes for food and space
- Most native fishes eat zooplankton during at least part of their life cycle
- Paddlefish, a species of concern, are obligate plankton feeders as adults
- Like the introduced zebra mussel, Asian carp can completely disrupt the ecology and the food web of aquatic systems
- Hazard to boaters
- Fish jump into moving boats
- High velocity impacts cause serious injuries and property damage
- Asian carp have little economic or sport value compared to native fishes

Potential Future Research Directions:

- Further determinations of life history of these fishes in the Missouri River Basin
- Development of fish control measures using sex-hormone attractants
- Diet studies to determine competition and predation on eggs and larvae of native fishes
- Development of models to determine the long-term effects of Asian carps on our aquatic ecosystem

USGS Research

- Since October 2003, CERC scientists have been tracking the movements and habitat selection of Asian Carp
- Preliminary research indicates that the fish are active and feed even during cold weather
- During the spring of 2003, both species have been observed to make upstream migrations of many miles, presumably for spawning.
- Asian carp are well-adapted to our large river systems and can make long distance migrations in short time periods



USGS researchers tracking Asian carp in the Missouri River using the RV Silver Shiner.